The magnitudes computed by using it are given under heading 7, designated M_1. It will be seen that the Hagen stars Nos. 1 to 4 cannot be represented by this even approximately.

Accordingly the log (diameter) was plotted against the Hagen magnitudes, and it was found that the following straight line represented the results very nearly :—

$$\text{Magnitude} = 35{\cdot}7 - 10 \log (\text{diameter}).$$

This formula is much better for the brighter stars, but fails for the fainter ones.

It may be noticed that on transforming it to the form

$$\text{Intensity of light} \propto 10^{-0{\cdot}4 \times \text{mag.}} \propto (\text{diameter})^4$$

this formula corresponds to the supposition that the diameter increases as the fourth root of the exposure time, if we suppose exposure time exactly equivalent to increased intensity of light. This law was obtained by Pritchard, *Proc. R.S.* vol. xl., though other laws have been found by other observers—the inverse square by Rutherfurd and the inverse cube by Prof. Turner at Greenwich in 1889 (see *Monthly Notices*, xlix. p. 292).

The results from this formula are given under head M_2.

7. Father Hagen gave the places of his comparison stars only approximately to the nearest second of time in R.A. and the nearest 0″·1 in D, and so no comparison is printed, though one was made and sent to him. The differences between his positions and those obtained by me are often quite large. This would seem to show the need of similar work being done for the whole list of variable stars.

Oxford University Observatory.

On the Absolute Proper Motions of Certain Double Stars showing Large Relative Motion. By H. Furner and J. Storey.

(*Communicated by the Astronomer-Royal.*)

During Mr. Lewis' work on double stars he has found a number which show large relative motions, and it is of interest to examine the meridian observations in order to determine these absolute motions. A list of these stars was given to us, and a first instalment of our work upon them we now beg to lay before the Society.

Some 100 stars have been examined, but owing to the lack of sufficient material we have confined our present paper to such stars as show by micrometer measures a relative motion of at least 0″·1 per annum.

All available catalogue places have been made use of and reduced to epoch 1900·0, applying Professor Auwers' systematic corrections as given in *Ast. Nach.* 3195–6 and 3463. The stars from the Lalande Catalogue were reduced to the epoch 1800 by the help of Dr. E. von Asten's tables (*Vierteljahrschrift der Astronomische Gesellschaft*, Jahrgang III., Supplement). The graphical method has been employed in determining the proper motions, greater weight having been given to Struve's *Positiones Mediæ* 1830·0 for the earlier catalogues. It is of interest to note that in about half the stars here considered the larger proper motion belongs to the fainter component; a circumstance which may be explained by the fact that if the brighter star had the larger proper motion in all probability this would have already been detected.

Catalogue.	Epoch.	R.A. 1900·0.	P.M. applied.	N.P.D. 1900·0.	P.M. applied.
		Σ 63. Mag. 8·2, 11·2.			
		$0^h\ 44^m$		78° 42′	
		s	s	″	″
W. B.	1825	58·47	58·63	41·6	45·0
Pos. Med. ...	32·4	58·62	58·76	45·4	48·4
Camb. Obs. ...	43·9, 42·8	58·68	58·79	45·7	48·3
Göttingen ...	60	58·75	58·83	42·1	43·9
Leipzig	71·4	58·71	58·77	48·2	49·5
Washington ...	89·7	58·72	58·74	46·4	46·9
Cincinnati ...	89·8	58·72	58·74	48·9	49·4
Greenwich ...	89·8	58·75	58·77	48·4	48·9
Cape	89·8	58·76	58·78	47·9	48·4
Radcliffe ...	90·9	58·74	58·76	47·6	48·0
P.M. of A		+0″·031		+0″·045	
The relative motion of B to A from micrometer measures :					
		−0″·159		0″·000	
P.M. of B		−0″·128		+0″·045	
		Σ 175. Mag. 7·9, 8·4.			
		$1^h\ 45^m$		69° 22′	
		s	s	″	″
Pos. Med. ...	1835·5	30·92	31·03	44·4	47·9
Berlin B.... ...	82·0	31·00	31·03	46·9	47·9
P.M. of A		+0″·024		+0″·054	
The relative motion of B to A from micrometer measures :					
		−0″·026		−0″·098	
P.M. of B		0″·000		−0″·044	

Catalogue.	Epoch.	R.A. 1900·0.	P.M. applied.	N.P.D. 1900·0.	P.M. applied.
		Σ 197. Mag. 7·2, 8·2.			
		1h 55m		55° 10′	
		h	s	″	″
Lalande	1794·9	10·27	10·74	59·0	50·1
W. B.	1828·8	10·56	·90	51·6	45·6
Pos. Med. ...	33·8	10·58	·90	54·3	48·7
Brussels	67·6	10·60	·75	50·8	48·1
Leiden	73·5	10·73	·85	50·7	48·4
P.M. of A		+0″·056		−0″·085	

The relative motion of B to A from micrometer measures :

−0″·082 +0″·064

Σ 436. Mag. 7·0, 8·2.

			3h 36m		° 56′	
			h	s	″	″
W. B.	1825		7·94	8·19	22·6	20·4
Pos. Med. ...	36·8		7·96	·17	24·0	22·2
Schjellerup ...	65		7·88	·00	26·1	25·1
Radcliffe Obs. ...	67·9		7·96	·07	...	...
Radcliffe... ...	91·7		8·16	·19	22·4	22·2
P.M. of A			+0″·050		−0″·029	

The relative motion of B to A from micrometer measures :

−0″·185 +0″·040

P.M. of B −0″·135 +0″·011

Σ 499. Mag. 9·2, 9·3, 11·2.

			4h 3m		66° 11′	
			s	s	″	
Lalande	1798·4		44·17	44·36	22·1	...
W. B.	1825		44·16	·30	25·9	...
Pos. Med. ...	27·0		44·08	·22	25·7	...
Rumker	36		43·97	·09	24·7	...
Romberg	75·5		44·26	·31	25·5	...
Berlin B.... ...	80·7		44·20	·24	26·1	...
P.M. of A			+0″·029		0″·000	

The micrometer measures show that the stars A and B are relatively fixed ; hence A and B have the same P.M. The relative motion of C to A from micrometer measures :

−0″·210 −0″·037

P.M. of C −0″·181 −0″·037

Catalogue.	Epoch.	R.A. 1900·0.	P.M. applied.	N.P.D. 1900·0.	P.M. applied.
		Σ 853. Mags. 7·8, 8·3.			
		$6^h\ 3^m$		78° 19′	
		s	s	″	
Pos. Med. ...	1833·7	35·59	35·11	34·5	...
Schjellerup ...	65	35·31	·06	32·5	...
Leipzig I. ...	70·6	35·26	·04	35·4	...
Washington ...	76·9	35·31	·14	34·1	...
P.M. of A		−0″·106		0″·000	
The relative motion of B to A from micrometer measures:					
		+0″·071		−0″·084	
P.M. of B		−0″·035		−0″·084	
		Σ 1142. Mag. 8·0, 10·4.			
		$7^h\ 42^m$		76° 20′	
		s	s	″	″
Lalande	1796·2	46·96	46·74	3·9	2·5
W. B.	1825	47·23	47·07	2·7	1·7
Pos. Med. ...	37·2, 37·7	46·91	46·78	2·1	1·3
Leipzig I. ...	70·6	46·87	·81	2·4	2·0
Paris	74·1, 75·1	46·80	·75	1·7	1·4
P.M. of A		−0″·031		−0″·013	
The relative motion of B to A from micrometer measures:					
		+0″·043		+0″·175	
P.M. of B		+0″·012		+0″·162	
		Σ 1202. Mag. 7·7, 9·8.			
		$8^h\ 8^m$		78° 50′	
		s	s	″	″
Lalande	1796·2	5·13	4·91	54·2	60·4
Piazzi	1800	5·23	5·03	55·9	61·9
W. B.	25	5·09	4·94	53·2	57·7
Pos. Med. ...	32·7	5·05	4·92	55·9	59·9
Madras	36·4	5·25	5·12	55·8	59·6
Paris, 1860 ...	60·6, 60·1	4·99	4·91	57·2	59·6
Leipzig I. ...	69·5	4·98	4·92	57·7	59·5
Romberg ...	75·4	5·00	4·95	58·5	60·0
Paris, 1875 ...	79·2	5·00	4·96	59·8	61·0
P.M. of A		−0″·029		+0″·060	
The relative motion of B to A from micrometer measures:					
		−0″·105		+0″·060	
P.M. of B		−0″·134		+0″·120	

Catalogue.	Epoch.	R.A. 1900·0.	P.M. applied.	N.P.D 1900·0.	P.M. applied.
		Σ 1329. Mag. 8·3, 8·5.			
		$9^h\ 10^m$ s	s	90° 49′	″
Pos. Med. ...	1827·2	38·67	38·30	21·1	27·0
Munich	42·9	38·52	38·24	21·7	26·3
Nicolajew ...	88·5	38·33	38·27	26·2	27·1
P.M. of A		−0″·075		+0″·081	

The relative motion of B to A from micrometer measures :

	+0″·065	−0″·099

Σ 1847. Mag. 8·5, 9·8.

		$14^h\ 23^m$ s	s	99° 45′	″
W. B.	1825	18·09	17·90	22·5	29·3
Camb. Obs. ...	1843·2	18·40	18·26	22·0	27·1
Pos. Med. ...	43·3, 45·5	18·59	18·45	21·7	26·7
Munich... ...	61·4	18·40	18·30	24·2	27·7
Paris	63·4, 60·7	18·53	18·44	24·4	27·9
Romberg ...	75·0	18·50	18·44	24·5	26·7
P.M. of A		−0″·035		+0″·090	

The relative motion of B to A from micrometer measures :

	−0″·105	−0″·042
P.M. of B	−0″·140	+0″·048

Σ 1893. Mag. 8·4, 10·0.

		$14^h\ 51^m$ s	s	60° 7′	″
Lalande	1795·5	1·22	0·91	18·0	22·7
Pos. Med. ...	1834·0	1·12	0·92	15·3	18·3
Paris	67·4	0·94	0·84	15·0	16·5
Leiden	71·2	1·00	0·91	17·3	18·6
P.M. of A		−0″·036		+0″·045	

The relative motion of B to A from micrometer measures :

	+0″·062	+0″·079
P.M. of B	+0″·026	+0″·124

Catalogue.	Epoch.	R.A. 1900·0.	P.M. applied.	N.P.D. 1900·0.	P.M. applied.
		Σ 2185. Mag. 7·0, 10·0, 7·7.			
		$17^h\ 29^m$ s	s	$83°\ 55'$	
W. B.	1822·5	55·23	52·52	74″·1	46″·2
Munich	61·6	54·18	·84	60·7	46·9
Brussels	71·1	53·65	·64	...	...
Glasgow	79·0, 77·4	53·50	·71	53·5	45·4
Romberg ...	80·4	53·47	·78	51·9	44·8
Leipzig II. ...	84·4	53·33	·78	51·0	45·4
Cincinnati ...	90·3	53·18	·84	50·0	46·5
P.M. of C		—0″·522	—0″·360		
		$17^h\ 29^m$ s	s	$83°\ 55'$	
Lalande	1794·6	55·62	55·36	22″·5	27″·6
W. B.	1825	55·38	·19	21·9	25·6
Pos. Med. ...	42 4	55·30	·16	24·3	27·1
Munich	61·6	55·30	·20	23·2	25·1
Brussels	70·0, 70·8	55·06	54·99	25·1	26·5
Paris	76·5	55·01	·95	25·1	26·2
Glasgow	79·3	55·13	55·08	26·0	26·9
Leipzig II. ...	84·4	55·12	·08	25·3	26·0
Cincinnati ...	90·3	55·20	·18	26·6	27·0
P.M. of A		—0″·037	+0″·049		

The micrometer measures give no appreciable motion between the stars A and B, so they probably have the same P.M. Now

P.M. of C	—0″·522	—0″·360
P.M. of A	—0″·037	+0″·049

Hence relative motion of C to A from computed P.M.'s is

—0″·485 —0″·409

The relative motion of C to A from micrometer measures :

—0″·580 —0″·488

Σ 2514. Mag. 9·0, 11·3.

		$19^h\ 16^m$ s		$22°\ 29^m$	
Pos. Med. ...	1833·0	49·86	...	19″·1	22″·5
Christiania ...	75·5	49·68	...	23·1	24·4
Greenwich ...	99·6	49·83	...	22·5	22·5
P.M of A		0″·000	+0″·052		

The relative motion of B to A from micrometer measures :

+0″·024 —0″·122

P.M. of B +0″·024 —0″·070

Catalogue.	Epoch.	R.A. 1900·0.	P.M. applied.	N.P.D. 1900·0.	P.M. applied.
	Σ 2515. Mag. 8·0, 9·0.				
		19h 20m		68° 40′	
		s	s	″	″
Lalande	1794·7	14·71	14·80	53·6	48·2
W. B.	1825·6	14·46	·53	49·2	45·4
Pos. Med. ...	28·6	14·87	·93	54·3	50·7
Berlin B. ...	81·6	14·93	·95	51·6	50·7
P.M. of A		+0″·013		−0″·051	
The relative motion of B to A from micrometer measures :					
		−0″·012		+0″·109	
P.M. of B		0″·000		+0″·058	
	Σ 2658. Mag. 7·0, 9·1, 10·1.				
		20h 11m		37° 11m	
		s	s	″	″
Lal. F.	1790	0·89	1·58	17·0	59·6
Groombridge ...	1811·7	0·66	·22	15·2	0·3
Pos. Med. ...	24·7	0·89	·37	14·4	1·8
Cambridge Obs. ...	44·7, 43·2	1·29	·65	10·4	0·8
Radcliffe ...	45·4, 45·7	1·95	·40	10·0	0·9
Brussels	71·4, 65·8	1·12	·30	6·3	0·6
Cambridge U.S....	77·3	1·24	·38	4·4	0·5
Cincinnati ...	95·2	1·17	·21	2·6	1·1
Greenwich ...	1900·5	1·36	·36	0·6	0·6
P.M. of A		+0″·058		−0″·168	
The relative motion of B to A from micrometer measures :					
		+0″·005		−0″·003	
Hence B as the same P.M. as A.					
The relative motion of C to A from micrometer measures :					
		−0″·032		+0″·136	
Hence P.M. of C is small.					
	Σ 2734. Mag. 8·2, 8·7.				
		20h 49m		77° 16′	
		s	s	″	″
Pos. Med. ...	1828·2	18·28	18·48	30·3	30·5
Leipzig I. ...	82·3	18·43	18·48	30·5	30·5
P.M. of A		+0″·040		+0″·003	
The relative motion of B to A from micrometer measures :					
		−0″·090		−0″·070	
P.M. of A		−0″·050		−0″·067	

Catalogue.	Epoch.	R.A. 1900·0.	P.M. applied.	N.P.D. 1900·0.	P.M. applied.
		Σ 2865. Mag. 8·5, 9·0.			
		$22^h\ 2^m$ s	s	20° 16′ "	"
Lalande F. ...	1789·7	10·52	11·90	31·3	29·1
Pos. Med. ...	1823·6	10·62	·57	29·6	28·1
Oeltz. Arg. (N.)...	41·6	10·50	·23	31·8	30·6
Brussels	67·3, 67·8	11·17	·58	28·7	28·1
Christiania ...	75·5	11·12	·43	27·6	27·1
Greenwich ...	99·2	11·52	·53	28·2	28·2

P.M. of A	+0″·064	−0″·020

The relative motion of B to A from micrometer measures :

	−0″·072	+0″·054
P.M. of B	−0″·008	+0″·034

Note on the Determinations of Positions and Magnitude of Stars in the Greenwich Astrographic Catalogue.

(*Communicated by the Astronomer-Royal.*)

The Introduction to vol. i. of the Greenwich Section of the *Astrographic Catalogue*, which is now in the press and will shortly be published, contains short discussions of the personality of the measurers, the probable error of the measures and of resulting right ascensions and declinations, and of the relation between magnitude of stars and the diameters of their photographic images. It may be of interest to lay before the Society a brief summary of these investigations.

I. *Personality of Measurers.*

The duplicate measurement of the plates in reversed positions, with a view to an increase of accuracy, was undertaken as a result of the meeting of the Astrographic Committee at Paris in 1896 June. Zones 64°, 65°, 66°, 67°, had by this time been measured at Greenwich in the direct positions of the plates. They were accordingly re-measured, the plates and the glass diaphragm being reversed right for left. The direct and reversed measures were compared, the investigation involving many thousands of measures of about 300 plates by eight different measurers. In the direct measures the same measurer measured both the 6^m and 3^m images, but in the reversed measures there were separate measurers for the two images.